

Spatio-temporal analysis of urban dynamics in Kashmir valley (1901-2011) using geographical information system

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Abstract

Kashmir valley is the most urbanized region of Indian Himalayan region. The study of distribution, growth and extent of its urban centers is vital to create a sound economic base as urban centers are reflectors of overall development of a region. The present study has been carried out using geographical information system to analyze the spatial distribution of different size class towns in different physiographic divisions of the valley. The study reveals that Srinagar is a primate city while almost all the urban centers fall in its zone of influence. The urban development in the valley is very lopsided and imbalanced with Srinagar witnessing tremendous growth and small urban centers have either recorded sluggish growth or have shown signs of stagnation. This twin process has made urban growth very complex phenomenon and a challenging task for city planners to ensure a reasonable quality of life and environment to the inhabitants. The unplanned and unregulated urbanization is leading to several kinds of environmental change which are more intensive and hazardous in the ecologically fragile Kashmir Himalayas. The present study will help in devising a balanced urban growth strategy in the region, by reducing the disparities in the levels of socio-economic development.

Keywords: Urbanization, Geographical information system, Kashmir Himalaya

INTRODUCTION

Urbanization is a process of change and its consequences when a society gets transformed from an agrarian economy to an industrial one and from a small homogeneous society to a large heterogeneous one [1]. The process of urbanization relates to concentration of people engaged in non-agricultural occupation and concentration of non-agricultural land uses in a specialized area as a consequence of population, occupational and land use shifts. It leads to the multiplication of points of concentration and to an increase in the size of individual concentrations as one of the most conspicuous aspects of urbanization process [2]. Urbanization thus involves:

- Concentration of people at population densities higher than those associated with agricultural populations with only very rare exceptions on either side.
- Population shifts (migration) from rural to urban areas.
- Occupational shifts from agricultural to non-agricultural and
- Land use shift from agricultural to non-agricultural.

While population shift implies a physical shift of population

from rural to urban, occupational and land use shifts can take place in situ. The distinction between rural and urban settlement is not very easy to comprehend. Quite often it has been asserted that an urban settlement should be disintegrated not only on the basis of defined demographic characteristics but also on the basis of the level of infrastructural facilities. According to the criteria adopted by Indian Census Department, urban area includes:

- All places with a municipality corporation, cantonment board or notified town area committee etc.
- A Place satisfying the following three criteria simultaneously:
 - A minimum population of 5,000.
 - At least 75% of male working population engaged in non agricultural pursuits and
 - A density of population of at least 400 persons per km².

The hill states of India by and large display low degree of urbanization largely due to the problems related to their terrain and the limitation of such a physiography in terms of mobility of goods, services and people due to poor accessibility. However large proportion of cultivated land and other areas are being encroached upon by the process of urbanization and expansion of infrastructure, services and economic activities in the region [3]. More recently, comparatively less accessible areas of the region are also being affected by process of fast urbanization mainly owing to the extension of road network, development of horticulture, gradual shift from primary resource development practices to secondary and tertiary sectors and the growth of domestic tourism through the publicity and marketing of new tourist sites. Consequently, there has been tremendous increase in size, area, number and complexity of urban settlements in the region resulting in the urban expansion as well as intensification of land use. The urban settlement spectrum of the Kashmir valley is dominated by the urban primary of Srinagar city

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which is the biggest urban centre of the Indian Himalayan Region. With the result, the very urban settlement hierarchy is not a graded and balanced one. The urban settlement system in the region is regulated and articulated through the Srinagar city, which is the nerve centre of all the socio-economic and political activities [4]. The urban growth is lopsided one as the growth of the medium and small sized towns is experiencing stagnation where as excessive concentration of urban growth and associated activities is taking place in Srinagar city.

STUDY AREA

The valley of Kashmir, often been termed as the paradise on earth, has a unique geographical personality. Nestled in north-western folds of the Himalayas, the Valley is surrounded on almost all sides by mountain ranges characterized by snow covered lofty peaks, cover the area of 15440 km². The mountain range rising to a height of 5550 meters on the north east side (fig.1) dip-down to about 2770 meters in the south, where the Banihal-pass (Jawahar tunnel) provides an exit from the valley. The only outlet for rivers is the Baramulla - George, where the placid Jhelum River leaves the smooth grassy banks and hurries headlong down its rocky course to the plains of the south [5]. The oval shaped valley is filled with thick deposits of alluvium, which has blanketed even the lower slopes of the surrounding ranges. It is drained by the Jhelum and its tributaries, among which Lidder, Indus, Pohru, Sandran, Bring, Vishav and Surkhmag are prominent. The valley is about 130 km long and 40 km wide [6]. On the basis of Stratigraphy and altitude, the valley of Kashmir may be divided into the four physiographic divisions of Jhelum valley floor, Karewas, Side valleys and the Greater Himalayan Range. The valley of Kashmir has continental climate characterized with marked seasonality. The genesis of Kashmir weather is intrinsically linked with the mechanism of weather in the Indian subcontinent in general. Never the less, the valley being surrounded by the Himalayan ranges has a modified sub-tropical climate

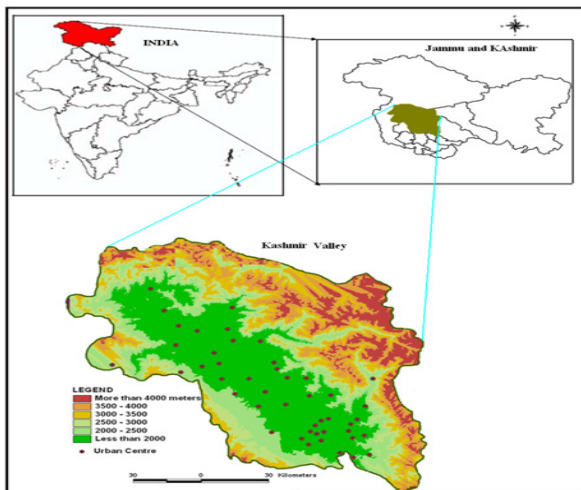


Fig 1. Location map and altitude zonation of Kashmir valley

MATERIALS AND METHODS

The present study has been carried out by the integration of Survey of India toposheets and census data using Geographical information System (Arc view 3.2a). The different thematic layers

were superimposed to analyze the spatial growth of urban centers in the valley. The Digital Elevation Model (DEM) of the Valley was prepared using Erdas Imagine Software. The altitude map derived from DEM along with the physiographic map was superimposed with the spatial distribution map of towns in order to determine the pattern of urban growth in the Valley. The data obtained from various sources like district gazetteers; census reports; Digest of Statistics; various departments like Town Planning Office, Srinagar; Census Department, Jammu and Kashmir; Population Resource Centre, University of Kashmir and other published literature has been compiled to derive the much required facts and figures.

RESULTS AND DISCUSSION

The Process of urbanization in Kashmir valley dates back to the remote past. The ancient city which is known as Pandrethan (Puranadisthan) was founded by the king Ashoka as his capital (272-230 B.C). Since then a systematic record of the origin of towns has been established in the form of capitals. In the medieval period, a number of capital places originated but were confined within the compass of modern Srinagar and acted mainly as the socio-economic and administrative centers. In the modern period a remarkable shift from rural areas to urban areas has taken place. On the whole Srinagar city has been the capital of Kashmir for more than 1300 years in the past which leads to greater degree of urbanization by way of functioning as a primate city.

District wise distribution of urban population

There is large variation in the level of urbanization among different districts in Kashmir valley. The level of urbanization in Kashmir valley is 28.7 percent (Census of India, 2011). Among the districts Srinagar maintains its 1st rank since 1901 so far as the percentage of total urban population of the valley is concerned. The analysis of table 1 reveals that Srinagar district has only two urban centers but it constitutes more than 60 percent of the total urban population of the Valley and is the highest urbanized district with the level of urbanization of 95.3 percent. Srinagar is vivid testimony of one of the historical cities of the country reflecting the rich and complex historical background. During the modern period (1947-1997) the city recorded more or less an uninterrupted growth through successive and concerted efforts after launching Five Year Plans that marked a beginning of the Planning era in the State. The process further got strengthened, as it became the seat of power and summer Capital of the State. The development of most of the administrative, education and medical institutions and residential colonies in and around the commercial hub (Lal Chowk) changed the form and morphological structure of the city. The establishment of a number of education and medical institutions and a number of planned colonies viz Jawahar Nagar, Karanagar, Nursing Garh, Gogji Bagh, Batmaloo, Channapora, Bemina etc. have resulted to the extensive sprawl of the city limits.

Anantnag District has the highest Number of towns (12) but accommodates only 13.8 percent of the total urban population of the valley with the level of urbanization of 25.6 percent. The Significant percentage of urban population in Anantnag, Kulgam, Bandipora and Baramulla is because of fertile soil, leveled topography, accessibility and greater interaction with Srinagar as compared to other districts. Kupwara district has the lowest percentage of urban population (3.5 percent) and lowest share of urban population of the valley (1.6

percent) owing to its accessibility and hill topography (fig. 2). The newly formed district of Kulgam ranks third (18.5) among the districts as far as the level of urbanization in the Valley is concerned. This is because of the fact that among the newly declared 12 towns in 2011,

6 are from Kulgam district only. The lowest number of urban centers is found in Shopian and Ganderbal districts where the respective district headquarters are the urban centers as they have recently been declared as separate districts.

Table 1. District wise distribution of urban population, Kashmir valley-2011

District	Population (Persons)	Urban Population		Share of urban population	Number of towns
		Absolute	Percent		
Kupwara	875564	31072	3.5	1.6	2
Baramulla	1015503	163861	16.1	8.3	7
Bandipora	385099	62738	16.3	3.2	3
Srinagar	1269751	1210292	95.3	61.1	2
Ganderbal	297003	27816	9.4	1.4	1
Budgam	735753	46667	6.3	2.4	6
Pulwama	570060	72156	12.7	3.6	5
Shopian	265960	14115	5.3	0.7	1
Anantnag	1070144	273449	25.6	13.8	12
Kulgam	422786	78075	18.5	3.9	7
Kashmir Valley	6907623	1980241	28.7	100	46

Source: Census of India, 2011.

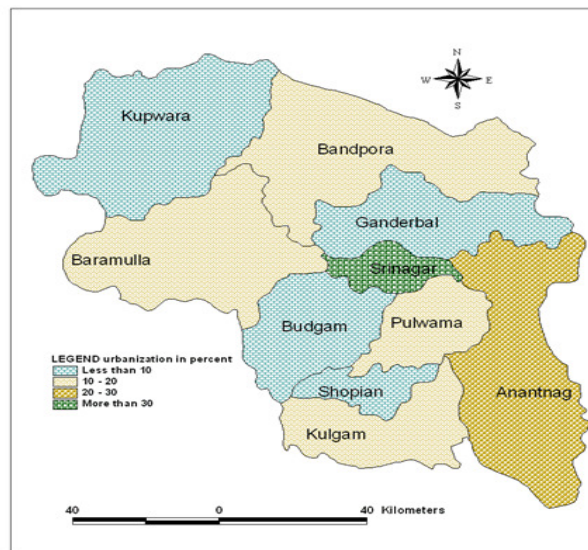


Fig 2. Level of urbanization in Kashmir valley, 2011

Growth in the number of towns: It is very difficult to compare the different urban centers so far as their growth is concerned because different urban centers were given the status of town in different censuses and also because definitions and criteria for urban centers have changed through time. Declassification of urban centers is a major problem, which comes in the way of generalization. The growth in the number of towns during 1901-2011 shows an increase of 45 towns (table 2). There have been fluctuations in the growth pattern of towns because of the definitional changes, some towns added and some declassified, as for example, in 1911, 11 settlements were classified as towns, but subsequently the towns namely Kulgam, Bandipora, Gulmarg and Uri were dropped in 1921. Again Mattan and Uri were added in 1931 which continued till 1941. It was during 1951 when Mattan was again dropped and in 1961 Pahalgam was freshly added in place of Handwara by matching the position of 1911. However 4 towns were added in 1971 of which Tral and Kukernag were the new classified towns followed by 7 towns in 1981. In 2001, 11 towns were added to the previous list while in 2011, 12 new towns are included of which 6 towns (50 percent) belong to Kulgam district alone.

The temporal increase in the number of towns in different size

classes (table 2) from 1901-2011, clearly shows that as the size of urban centers decreases their number increases. From 1911-1961 (except 1951) highest number of urban centers were class VI towns. In 1971, 1981 and 2011 highest number of towns were class V towns. However in 2001 class IV towns were dominating. Among the newly classified 12 towns in 2011, 4 are class IV towns and the remaining 8 are class V towns. The total number of towns in the Valley has increased from only one urban centre in 1901 to 46 urban centers in 2011 (fig. 3).

The highest growth in the number of urban centers was recorded for 1901-1911 where there was 12 fold increase in the number of towns. However, in 1921 the number of urban centers decreased to 7 and remained constant for 1931 and 1941 while it again decreased to 8 in 1951. From 1961 the number of towns is increasing at an increasing rate (table 2). It increased by 34 towns in the last fifty years. It was only in 2001 that the three medium towns of Anantnag, Sopore and Baramulla crossed the population of fifty thousand and attained the status of large towns (class II towns). However in 2011, Anantnag crossed the mark of one lakh population and becomes Class I town. Thus for the first time we have two class I towns. It is important to note that Srinagar served as the only Class

I town for a period of more than a century. Anantnag has the advantages of accessibility, connectivity and interaction which makes its growth so prominent as it serves as an important link connecting Jammu city with the Srinagar city. The class VI towns are generally those statutory towns which are classified mainly on the basis of

tourism. Pahalgam and Gulmarg were given this special status from 1961. It is important to mention here that the total population of Gulmarg is only 243 persons. However Pahalgam crossed the population of six thousand for the first time in 2011.

Table 2: Distribution of towns and urban population by size classes (1901-2011)

Size Class By population	Number of towns and percentage of urban population										
	1901	1911	1921	1931	1941	1951	1961	1971	1981	2001	2011
City (Above 100000)	1 (100)	1 (76.63)	1 (80.32)	1 (80.19)	1 (79.39)	1 (79.48)	1 (76.80)	1 (75.12)	1 (73.18)	1 (63.49)	2 (67.9)
Large towns (50000-100000)	-	-	-	-	-	-	-	-	-	3 (15.64)	2 (6.8)
Medium Towns (20000-50,000)	-	-	-	-	-	-	1 (5.49)	3 (14.50)	3 (12.27)	1 (1.76)	6 (7.6)
Small Towns (10000-20000)	-	-	-	2 (9.98)	3 (13.81)	3 (15.28)	2 (10.11)	-	3 (4.33)	14 (13.67)	16 (11.3)
Urban Village (5000-10000)	-	3 (14.46)	3 (14.08)	1 (3.17)	-	3 (4.96)	3 (4.67)	7 (8.69)	9 (8.22)	9 (4.30)	17 (6.2)
Urban Hamlets (Below 5000)	-	8 (8.91)	3 (5.6)	5 (6.66)	5 (6.80)	1 (0.28)	5 (2.93)	5 (1.69)	7 (2.00)	6 (1.14)	3 (0.2)
Kashmir Valley	1 (11.2)	12 (14.64)	7 (14.21)	9 (15.67)	9 (17.30)	8 (18.41)	12 (20.23)	16 (23.13)	23 (26.42)	34 (26.92)	46 (28.7)

Note: figures in parenthesis indicate percentage of urban population

Source: Census of India, 1901 to 2011

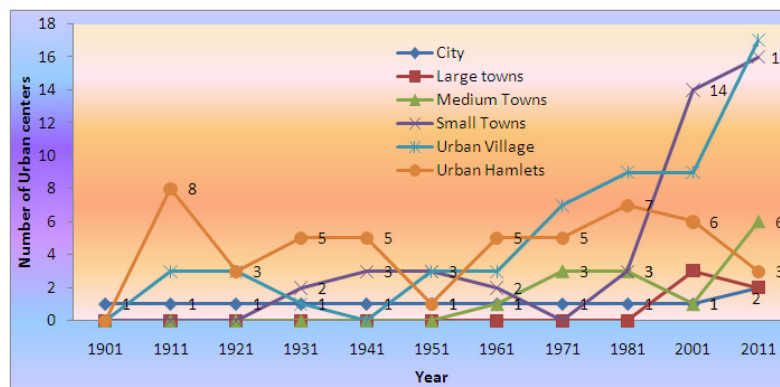


Fig 3. Growth in the number of towns in different size classes, Kashmir valley, 1901-2011

The distribution of urban population by size classes shows that class I towns of Srinagar and Anantnag constitute 67.9 percent of the total urban population (fig. 4) followed by class IV towns (11.3 percent). The share of large towns has decreased from 15.64% in 2001 to 6.8 percent in 2011 because Anantnag has now attained the status of Class I town and only two towns of Baramulla and Sopore remain as large towns as none of the medium sized towns attained

the status of large town. It is also evident that all the three medium class towns in 1981 qualified the status of large towns in 2001. But only one town has been able to become medium town in 2001 from three small towns in 1981. The class III towns and Class V towns constitute 7.6 percent and 6.2 percent of the total urban population of the valley respectively.

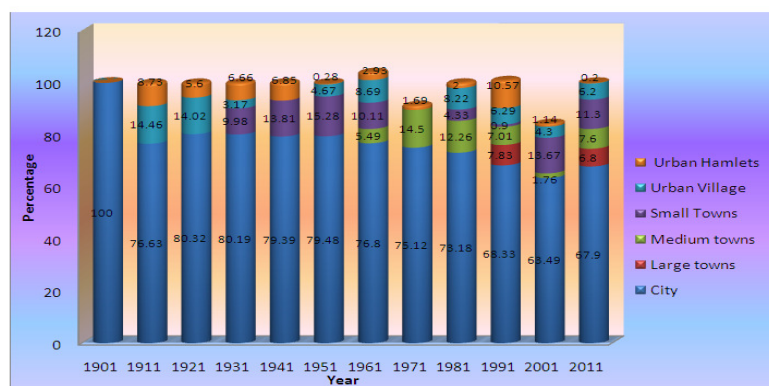


Fig 4. Percentage of population in different size class towns, Kashmir valley, 1901-2011

The net growth of urban population of the region during 1901-2011 is 1515 percent with the average annual growth rate of 13.77. Urban population increased by 18.5 lakh in the last 110 years with the steady growth in the proportion of urban population to total population except slight decline in 1921. However, the breakup in the proportion reveals that the early decades (1901-1921) had a meager growth on account of slow pace of socio-economic development. During 1931-51 some acceleration in the growth did take place, but on account of political unrest, little development had taken place in towns. The post-independence period may however be characterized by a rapid growth due to the successive five year plan and partly due to the tourism. The explanation lies in the fact that in 1901, there were 122618 persons living in only one town but in 2011, there are 46 towns inhabiting 19.8 lakh persons which accounts for 28.7 percent of the total population of the Valley. The highest decadal growth was registered in 1981. This is because of the fact that a number of new towns were added to the previous list and also partly because of tourism. The lowest growth of urban population (1981-2010) is due to political turmoil which badly effects tourism

industry and socio-economic development in Kashmir Valley. In this period of twenty years the urban population remained almost constant with the negligible growth from 26.42 percent to 26.92 percent. It is important to mention here that in the same period of time urbanization was on peak in rest of the India.

The Distributional Characteristics of towns:

The distributional pattern of towns corresponds largely with the physiographic conditions of the region. The Karewas have the problem of irrigation and upland topography and infertile soil for the cultivation of crops. The important towns which fall in this sub-region are Shopian, Tral, Pampore, Kulgam, Pulwama and Budgam. Similarly in case of rim lands famous hill resorts namely Pahalgam and Gulmarg are found while Uri and Kupwara wholly lie on the face of the mountain. The maximum concentration of towns in the Jhelum Plain is obvious because of the perennial characteristics, fertile soil and a somewhat leveled plain.

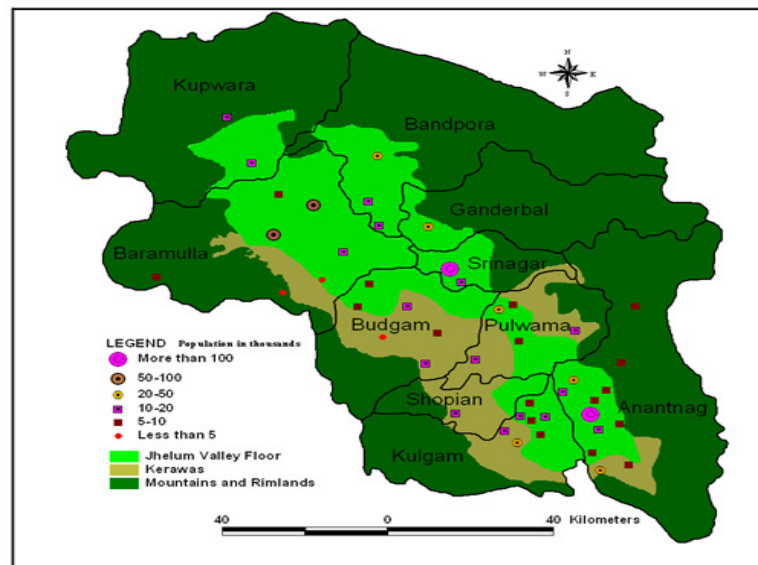


Fig 5. Distribution of urban centers on different physiographic divisions, Kashmir valley, 2011

The analysis of table 3 reveals that Jhelum plain which occupies 23.57 percent of the total geographical area inhabits 30 urban centers constituting 90.95 percent of the total urban population of the valley. This is due to the fact that all the large and medium sized towns are located on Jhelum plain and have advantage of location, topography, centrality and accessibility which makes implementation of modern facilities and technology easy there and consequently these urban centers (especially Srinagar) have emerged as religious, cultural, commercial and administrative

centers. Karewa lands with the total geographical area of 11.86 percent of the Valley have 11 towns inhabiting 7.12 percent of the total urban population. Mountains and rim lands being most extensive and widespread physiographic division cover 64.57 percent of the total geographical area inhabit 5 urban centers with 1.93 percent of the total urban population of the Valley. The urban centers in mountain areas have emerged mostly as tourist towns receiving tourists from all parts of the world.

Table 3: Number of towns in different physiographic divisions, Kashmir valley-2011

Physiographic Division	Area (Percent)	Number of towns	Population (percent)
Jhelum Valley Floor	23.57	30	90.95
Karewas	11.86	11	7.12
Rim Lands and Mountain Faces	64.57	5	1.93
Total	100	46	100

Source: Computed from Census of India, 2011; Survey of India toposheets, 1961 and DEM.

CONCLUSION

Kashmir valley being the most urbanized region as compared to other Himalayan states is dominated by the urban primacy of Srinagar city which remained the hub of administration from ancient times. There are large variations in the urban growth scenario of different urban centers in the valley. The city of Srinagar is witnessing unprecedented urbanization in terms of spatial expansion and population growth as a result of natural growth and migration. The distributional pattern of towns largely corresponds to the physiographic divisions of the valley. The heavy concentration of urban centers is found in the Jhelum valley floor and all the large and medium towns are located there along with Srinagar city. The present study has identified two important problems of urbanization in Kashmir valley. The first one is related to the disproportionate growth and concentration of people in Srinagar city which has given birth to many urban ecological and socio-demographic problems. This has happened largely because of the absence of any planning strategy at the regional level and could be rectified by providing civic amenities, infrastructural facilities and employment opportunities in small and medium towns. This will reduce immigration to Srinagar city as people would be attracted to other towns of the valley. This will also help in maintaining balanced urban development of the region. The second problem relates to the increasing concentration of people in the mountain towns of the valley which have developed mainly on account of tourism. In order to earn more revenue from tourism, the state government is developing infrastructural facilities without taking into consideration the carrying capacity of these fragile tourist nodes. It is important to mention here that world famous tourist destinations of Pahalgam and Gulmarg were given special status as tourist towns in 1961 which otherwise were not falling in the

criteria to be declared as towns. These small towns are now facing environmental degradation mainly because of the large inflow of tourists beyond their carrying capacities. Study of urban centers for planning purposes is of vital importance for the overall development and wellbeing of the society. The geographical information system has proved as a very helpful tool for analyzing the urban dynamics in the valley and it is recommended that modern techniques of remote sensing and GIS are employed to formulate policies of urban development by analyzing their spatio-temporal dynamics of population growth and land use change.

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